

DESIGN CRITERIA

I. GENERAL

The City of Newport Beach Design Criteria Manual provides consultants with City's project requirements pertaining to the production of construction drawings, project deliverables, related quality assurance, submitting final hard copies and digital plans. These requirements apply to all engineering disciplines.

Consultants shall adhere to these requirements when preparing plans and specifications for all projects done within the City that require **Public Works Plan Check**. Conformance to these requirements shall be verified by the City when ever an invoice is submitted for payment.

The Manual is not intended to replace Codes, accepted industry standards and practices or to teach computer aided drafting.

A. Improvement Plans

1. Hard copy submittals

- a. All submitters shall contact the project engineer to obtain a project drawing number. The project number shall be reflected on all drawing sheets.
Eg. W-3567-S
- b. Drawings shall be plotted on Mylar at exactly 24" X 36" cut sheet. Drawing border should be 1" on the left side of the sheet and ½" along the other three sides. Please refer to the on line CAD submittal guidelines at (City web site address) for Newport Beach sample standard sheets drawings, line types, layers and naming drawing files.
- c. All sheets within the plan set shall be issued a **SEQUENTIAL NUMERIC SHEET NUMBER**. (Alphanumeric numbers shall not be assigned in lieu of numeric numbers. No duplicate numbering such as sheet 6 and 6A etc. shall be accepted.
- d. All title sheets shall have an index indicating the sheet numbers issued. A vicinity map, a legend of abbreviations, symbols and the line types used shall also be included on the title sheet.
- e. Plans shall be prepared with indelible waterproof ink on Mylar. Vellum or paper will not be accepted for final plan set.
Plans may also be electrostaticly plotted on Mylar media with fixed non-smearing toner. Thermally plotted sheets will not be accepted.
- f. Scale for profile shall not be smaller than 1" = 40' horizontal and 1" = 10' vertical. The vertical scale should be changed to appropriate scale for readability when grades are steep or very flat.

Scale for plan views shall not be smaller than 1" = 40'. For complex intersections or where greater details are required, the scale shall be 1" = 10' or as approved by the project engineer. Standard drawing scales are 1"=20' and 1"=40' for plan views. Standard drawing scale for profile are 1"=4' and 1"=8' .

- g. Large tracts shall have separate small-scale maps showing the overall layout of water, sewer, storm drain, and street lighting systems.
- h. Street, Storm Drain, Sewer, Water, Etc. profiles shall be shown above the plan view. Street profiles shall reflect the locations of all utilities, including Sewer, Storm, water and other facility crossings.
- i. Typical cross sections of streets shall show locations of all utilities, including oil, petroleum, gas, water, sewer, telephone, cable TV, street lighting, traffic signal, electrical and other facilities.
- j. At least one typical section is required for each street. Multiple cross sections may be required for complicated projects by the Engineer.
- k. Bench mark(s) shall be listed on the title sheet, based on the National Geodetic Vertical Datum of 1988, (NAVD88), with complete reference to Benchmark Designation, Elevation, Type and etc.
Existing survey monuments that are used in the mapping or the design of the project shall be shown on plans. Horizontal coordinates of all control points, centerline points and other survey points in the work area shall be shown. To facilitate the identification and replacement of survey points, the plans shall describe each point as found in the design survey. If necessary a separate "Horizontal Control Plan" may be prepared.
- l. All plan for major reconstruction and realignment of roadways shall include the basis of bearing on the title sheet and tie the centerline of the road into the California Coordinate System (NAD83) in at least one location or as many as mutually agreed by the City Surveyor or the Project Engineer.

Stationing used for the proposed improvements shall match those used in previous or original improvement plans.

- m. Each sheet shall only list the construction notes and details that apply to that sheet. When necessary additional detail drawings shall be shown on plan sheets identified as "Detail Sheets". Thence each said sheet shall clearly reference to the related detail sheet.

2. (ACAD) /Digital Submittals

To facilitate the transfer of information into the City's Geographic Information System and the digital storage of plans all final plans must be submitted on

compact disk in addition to a hard copy and conform to the following specifications:

- a. The entire project shall be prepared in full size (1 to 1), in model space using the State Plane Coordinate System, California zone 6, SPCS 83 FIPS zone 0406 California Coordinate System, (CCS83) Zone 6 FIPS 0406, North American Datum of 1983 (NAD83, 1991.35 EPOCH GPS Adjustment). In accordance with County of Orange Ordinance 3809 and digital submission of Cadastral Surveys Information and Specifications.
- b. Survey maps, Parcel maps and Lot line adjustment maps shall be prepared per Orange County Ordinance No. 3809/ Digital Map Submission of 1991 (the most recent and updated version).
- c. CADD (dwg) file should include paper space layout for each individual sheet and overall uncut site plan on model space, which encompasses the design of the entire project in state plane coordinate.
- d. Paper space shall be designed so that final plotted sheets will measure exactly 24" X 36". Drawing border should be 1" on the left side of the sheet and ½ along the other three sides. All plotted text shall be at least 1/ 10 of horizontal scale.
- e. PDF electronic image files with resolution of 300DPI or finer of each final or as-built sheet should be included.
- f. All drawings (Layout sheets) shall be in compliance with Newport Beach standard sheets, linetypes, blocks, standard layers and naming drawing files. ACAD standard fonts shall be used. Refer to on-line up to date cadd submittal guidelines (City.newport-beach.ca.us) for city of Newport Beach standard sheets, layering requirements and line type file.
- g. All submitted CDs of final plans shall be labeled with the project name, number and list of the files. All file names shall comply with city standard file naming procedure.

Eg. A water main replacement project will have a CAD file name as W_4567_S.dwg and W_4567_S.tif for image file. When submitting separate files for each individual sheet then an extension (_001) for sheet one of hundred and so on shall be added to the end file name (eg W_4567_S_001.dwg).

All necessary associated files shall be included in the submitted disk. The files presenting the final plan sheet shall be clearly identified to match the hard copy set of drawings.

Contact the project engineer for instructions and help on how to name the drawing files.

- h. All submittals shall be in Auto Cad drawing file version 2002 or later (.DWG).
- i. Submit detailed written instructions (including exact directory path and file names) on the procedures that are required to extract the files from the CD-ROM. Complete file sets including copy of all reference files and plot files shall be submitted. All drawings should include only **Implicit Xref Paths**. All reference files should be included in the same directory and follow the file naming structure.

NOTE : When the files were either "backed-up" or stored using compression software or third party program, submitting party shall provide a legal copy of the compression software or third-party programs for the City to retrieve files.

- j. Shading is not permitted. Hatching is acceptable in a separate layer. Aerial photos may be used with approval of project manager.
- k. All drawings should be done on one side of the sheet for City scanning. Double sided plan sheets can not be scanned and will not be accepted.
- l. Use Poly-line type to construct each building footprint to form a closed polygon.

NOTE: Digital data will be checked for:

Correct layering, correct coordinate system and consistent digital and hard copy plans

3. Approval Signatures

- a. Each hard copy plan sheet submitted for the engineer's approval shall be signed by the Civil Engineer, Architect, Etc. responsible for that design, except that a sheet of complex grading, structural, mechanical or electrical plans shall be signed by the Professional Engineer licensed in that discipline who is responsible for that design.
- b. Plans to be submitted for the Engineer's approval shall be signed and sealed by professional engineer, licensed by the State of California.
- c. Plans containing revisions subsequent to the Engineer's original approval shall be re-signed per the requirements of 2 a. and 2 b. prior to resubmittal for the Engineer's approval.
- d. Traffic Control Plans, where required shall be signed and sealed by a Traffic Engineer licensed by the State of California.

4. Miscellaneous

- a. Improvements shall be designed in accord with the City's "*Standard Special Provisions & Standard Drawings*", these Design Criteria, and the "*Standard Specifications for Public Works Construction*", latest edition, with all supplements.
- b. Utilities in easements parallel to side lot lines shall be laid out so that the easement is all on one lot. Minimum width for water, sewer & drainage easements shall be ten (10) feet. Such easements shall be exclusively for utility purposes and shall preclude any building, structure, foundation, wall footing or tree, furthermore, the utility shall not be located within a 1:1 plane of influence projected down ward from a building, structure, etc. Means of maintaining access to the easement must be provided.
 - (1.) Easements for more than one City-owned utility shall be wider as determined appropriate by the Engineer.
 - (2.) Easements shall be exclusively for City-owned utilities unless otherwise approved by the City and the other public utility agency(ies).
- c. Water, sewer, drainage, structural and street lighting design calculations shall accompany plans submitted for checking unless the Engineer specifically waives this requirement.
- d. A letter of transmittal addressed to the Project Engineer shall accompany plans submitted for approval.
- e. Plans shall be checked for consistency, accuracy, drafting and conformance with Standard Special Provisions, Standard Drawings, Standard Specifications, design calculations, geotechnical recommendations, and these Design Criteria prior to the Engineer's approval. If plans have obviously not been checked, they will be returned unapproved by the Engineer.
- f. Check prints shall accompany revised plans, which are resubmitted for approval. Resubmitted plans shall be accompanied by a letter of transmittal addressed to the Project Engineer.

B. Survey Monuments

- 1. Boundary Corners

Permanent iron pipe monuments of a type approved by the City Engineer shall be set at each boundary corner of the subdivision, along exterior boundaries at intervals of not over 500 feet, at the beginning and end of property line curves and at any other points as may be required by the City Engineer.

2. Street Centerline Intersections

Concrete monuments with cast iron ring and cover of a type approved by the City Engineer shall be set at intersections of street centerline tangents and where such intersect on private property, at the beginning and end of the centerline curve unless otherwise approved by the engineer.

3. Benchmarks

Permanent elevation benchmarks of a type approved by the City Engineer and referred to the City datum shall be set at locations approved by the City Engineer.

4. GPS Survey Control - State Plane Coordinates

The legal description for all subdivisions (tract maps & parcel maps), easements and public improvement projects shall:

- a. Use as basis of bearing, a line of record established by first order, class II (or better) survey control monumentation.
- b. Tie to the California State Plane Coordinate System, California zone 6, SPCS 83 FIPS zone 0406 California Coordinate System, (CCS83) Zone 6 FIPS 0406, North American Datum of 1983 (NAD83, 1991.35 EPOCH GPS Adjustment). In accordance with County of Orange Ordinance 3809 and digital submission of Cadastral Surveys Information and Specifications.
- c. Use a monument listed on the County Surveyor's active list of control points and monuments and satisfy the requirements of "4a" & "4b", above.

II. STREETS

A. Widths

1. Minimum street widths shall be in accord with STD-100-L. Additional width may be required for bikeways, bus turnouts, and/ or for special intersection design.
2. Alley widths shall be a minimum of 20 feet in residential areas and a minimum of 30 feet in commercial and industrial areas.
3. Intersections of arterial roadways may require special design. The use of left turn pockets, double left turn pockets, free right turn lanes, right turn islands, raised medians, etc., shall be investigated and approved by the city.
4. Streets improved to half or less than planned width shall be provided with paved shoulders or ditches. The unimproved portion of the street shall

drain away from the paved section.

B. Grades

1. Minimum street grade shall be 0.40% and maximum shall be 7.0% unless the requirements are specifically waived by the Engineer.
2. Vertical curves are required when grade breaks exceed 0.40%.
3. Normal cross fall on A. C. pavement shall be 1.7%.
4. Where grades exceed 5% and on lesser grades where tributary drainage areas are large, 1" x 4" redwood boards or other approved means shall be placed across parkways at 20 foot intervals to control erosion.

C. Alignment

1. Streets shall normally be at least 50 feet on tangent adjacent to the intersection measured from the end of the ECR. An angle of intersection more than 10° from a right angle requires special approval and design.
2. The centerline of streets entering upon opposite sides of any given street shall be offset by at least 150 feet for a minor residential street and 300 feet for other streets.
3. Cul-de-sacs shall not exceed 500 feet in length and shall conform to STD-102-L.
4. Minimum centerline radii shall be as follows:

a.	Local streets	R = 250 feet
b.	Secondary streets	R = 800 feet
c.	Primary streets	R = 1200 feet or greater
d.	Major street	Special Design (55 mph)
e.	Hill streets	Special Design
5. All corner cut-offs for local streets shall have a 15 feet property line radius. Arterial streets shall have a minimum 25 feet property line radius. A greater radius may be required if streets do not intersect at right angles.
6. Minimum length of tangent between reversing curves shall be 100 feet.

D. Structural Section

1. Design shall be in accord with California Department of Transportation's Highway Design Manual (Caltran's Design Manual), latest edition.
2. Unless otherwise specified the minimum structural sections shall be as follows:

a.	Alleys	6" P.C.C. (less than 16' wide)
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- | | | |
|----|------------------|---------------------------------|
| b. | Alleys | 3" A.C./ 6" A.B. (16' or wider) |
| c. | Local streets | 3" A.C./ 6" A.B. |
| d. | Arterial streets | 4" A.C./ 10" A.B. |
| e. | Bike trails | 3" A.C./ 4" A.B. |
| f. | Parking lot | 3" A.C./ 4" A.B. |

3. Minimum section shall be designed as required by results of soils tests before plan preparation. "R" value shall be verified after rough grading.
4. Minimum design traffic indices for streets shall be as follows:

- | | | |
|----|--------------|----------------|
| a. | Arterials | Special Design |
| b. | Collectors | 5.5 |
| c. | Minors | 5.0 |
| d. | Parking lots | 4.0 |

E. Curbs

1. Height of curb face for local streets and parking islands shall be 6 inches.
2. Height of curb face for arterial streets shall be 8 inches.
3. Height of median curb faces shall be 8 inches. Subsequent pavement overlays shall not reduce median curb heights to less than 4 inches.

F. Sidewalks

1. Minimum widths shall be as follows:

	Adjacent to Property Line	Adjacent to Curb*
a. Local streets	4.0'	5.0'
b. Secondary streets	8.0'	8.0'
c. Primary streets	10.0'	10.0'
d. Major streets	10.0'	10.0'

*Requires special approval.

2. Minimum thickness shall be 6 inches at driveway approaches and 4 inches at other locations.
3. Sidewalks are required on Designated Significant Link Sidewalks per City Council Resolution No. 88-88 and subsequent additions/ revisions.
4. All sidewalk access ramps shall conform to the State approved standards at the time of construction.

G. Sight Distance

1. Sight distances shall be in accord with the Caltran's Design Manual, latest edition.
2. Sight distance requirements for driveways and intersections for major, primary, secondary and local streets shall be per STD-110-L.

H. Frontage Roads

1. Frontage roads shall enter arterial streets through "Bulb-Type Intersection" capable of storing at least four (4) cars between the frontage road and the major street.

I. Street Lights

1. All street light circuits shall be 240 volt, single phase powered circuits.
2. Street lights shall be one of the following types with appropriate pole spacing for the corresponding street type:

Street Type	Pole * Type	Mounting Height	Bracket Arm	Recommended HPSV Lumens	Recommended Lamp Watts	Recommended Spacing **	Recommended Luminaire
Residential	I	20'-9"	4'	N/ A	50-70	200' one side or staggered	G.E.'s M250 A2 POWR/ Door cut off or see STD202-L-E approved equal.
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	III	12'-0"	NONE	"	"	180' one side	
	III	14'-3"	"	"	"	or staggered	
	III	15'-3"	"	"	"	"	
	III	16'-0"	"	"	"	"	
	V	9'-2H"	NONE	N/ A	50-70	"	
Collector	I	26'-3"	4'	5,800	70	180' one side	G.E.'s M250 A2 POWR/ Door cut off or
	I	27'-9"	6'	"	"	"or staggered	
Secondary	II	29'-9"	8'	9,500	100	"	approved
	II	34'-9"	"	"	"	"150' one side equal.	
Primary & Major	II	34'-9"	"	16,000	150	or staggered	
	IV	35'-0"	"	"	" "		

*See Standard Drawings

**Where possible, poles and spacing shall conform with existing poles and spacing in adjoining areas.

3. Residential lighting shall be considered non - safety lighting for the convenience of the community. Lighting levels and lamp wattage shall be based on specific community needs. The City Engineer may require special safety lighting with specified illumination requirements at specific locations to address special conditions that may exist. Residential lighting shall consider impacts to adjacent residents, views, and environmentally sensitive areas.

4. Designs for illumination and spacing of lights on arterial streets shall be submitted for review by the Engineer.
 - a. Additional lights shall be provided where calculations indicate the need for additional poles or wattages are greater than those indicated in these standards.
5. A field check of existing overhead wire is required whenever poles over 30 feet in height are to be specified or wherever else overhead power lines are to coexist with street lights.
6. High pressure sodium vapor luminaries shall be specified and used.
7. Plans showing the street lighting system shall ordinarily be shown on separate sheets.
8. Street lights shall normally be staggered and placed on opposite sides of the street.
 - a. In a terraced lot subdivision, street lights shall be placed on the down hill terraced side of the street.
9. Circuit details shall be in accord with STD-204-L.
 - a. Each circuit shall be provided with an approved two (2) pole circuit breaker installed in an approved all stainless steel component box.
 - b. All components of the service meter pedestal cabinet shall be fabricated from stainless steel.
 - c. Breaker capacity shall be sized to accommodate the load on the circuit from connected lights.
10. Light standards shall not be set closer than 5 feet from a curb opening, fire hydrant, manhole, water main or sewer main.
11. At intersections:
 - a. The light shall be placed on the far right corner of the major street.
 - b. Larger intersections may require more than one light.
 - c. Where the intersection is a T-intersection the light shall be placed across the street at the end of the street which dead-ends at the "T".
12. Above ground service cabinets shall be placed to minimize interference with pedestrians on sidewalks. For full width sidewalk, place service cabinet at back of walk or on easement behind walk.

13. Junction boxes shall be provided:
 - a. At every branch conduit junction.
 - b. At every splice point.
 - c. Every 150 feet of conduit run.
 - d. At every street light location in accord with the corresponding Standard Drawing.
 - e. At every place where there have been more than 4 conduit sweeps placed since the last junction box.
14. Conductors shall be color coded and labeled Per STD 208-L.

J. Bikeways

1. Bikeways shall be provided on all arterial streets and where the Master Plan of Bikeways shows bike routes.
2. Bikeway facilities shall be designed in accord with the *"Planning and Design Criteria for Bikeways in California"*, latest edition, prepared by the State of California Business and Transportation Agency -- Caltrans.

III. WATER SYSTEM

A. General

1. Substantiating engineering calculations for demand, pressure and structural design of pipe shall accompany all plan submittals to the City.
2. Unless otherwise specified, water pipe material shall be ductile iron, polyvinyl, AC, chloride or steel (by special permission).
3. All water pipe shall have a minimum working pressure rating of 150 psi for normal operation and shall be capable of withstanding test pressures of 75 psi or greater. Higher pressure ratings may be dictated in certain locations within the distribution system. Consult the Utilities Department for further details.
4. Special design and approval is required for pipe fabricated from non-standard pipe materials.

B. Demand Design

1. Water consumption and demand design shall be incorporated into all water system designs where water mains, regulators, fire hydrants and/ or pump stations will be added or considered.
 - a. System pressure and demand design shall be as per the table(s) and data listed herein below, except where modified by the Engineer.
 - b. System fire flow delivery shall be provided via design of pipes, pumps and reservoirs sized in accord with the table(s) and data listed herein below, except where modified by the Engineer.

2. Domestic Water Demands - System Demands:
 - a. Design flows for determining pipe size, system impacts and fire flow availability shall be in accord with the table(s) herein below. Utilize the average daily, maximum day and peak hour flows and factors for system pressure design for the appropriate water pressure gradient(s).
 - (1.) Where the water facilities under design are proposed to be in a new pressure gradient or where more than one pressure gradient is involved; consult with the Engineer for more detailed additional requirements.
 - (2.) Refer to the Public Works or Utilities Department for a determination as to the correct water pressure gradient(s) applicable to the design.
 - b. The demand table below has been established based on actual water consumption data from water billing, consumption and production records over a period of years.

This table will from time to time be revised to reflect current water consumption trends.
 - c. "Maximum Day" and "Peak Hour Demands" shall be determined from the appropriate factor multiplied by the demand value in the "Domestic Water Demands Table".
 - (1.) These factors were determined based upon general water consumption trends in all pressure zones using the available data and trend analysis.
 - (2.) These factors will from time to time be revised to reflect current water consumption trends.

3. Domestic Water Demands Table:

Pressure Gradient (name)	3 yr. Average Average daily flow (number)	Maximum Month Max. Mo. Factor (avg day:max mo)	Maximum Month Average day flow (gpcd)
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Coastal Newport	1	420	1.55	651
Big Canyon Reservoir	2	510	1.98	1012
San Joaquin Reservoir	3	508	3.85	1956
Spyglass - Harbor Ridge	4	1072	1.48	1585
Spyglass - Harbor Ridge Booster	5	1080	1.33	1433
Alta Vista Regulated	6	766	1.29	985
Ocean Birch Regulated	7	680	1.26	857
Harbor View Regulated	8	591	1.45	859
Newport Center Regulated	9	3379	2.13	7192
Big Canyon Regulated	10	938	2.36	2214
North Ford Regulated	11	393	1.21	475
Balboa Island	12	324	1.26	409
Lido Island	13	420	1.15	482
Granville Regulated	14	344	1.39	478
Bren Tract Regulated	15	636	1.23	782
Dover Shores Regulated	16	685	1.26	860

- a. "Maximum Day Demand Factor" shall be 1.31.
- b. To determine the "Maximum Day Demand" value, multiply "Maximum Month; Average Daily Flow" value by the "Maximum Day Demand Factor".

(1.) "Maximum Day Demand" = (1.31) X (Maximum Month; Average Daily Flow Value)

(2.) Eg., For "Balboa Island" gradient;

$$\text{"Maximum Day Demand"} = (1.31) \times (409 \text{ gpcd}) = 536 \text{ gpcd}.$$

- c. "Peak Hour Demand Factor" shall be 1.85.
- d. To determine the "Peak Hour Demand" value, multiply the "Maximum Day Demand" value obtained via the procedure above, in subparagraph "b", subsection (1)., by the "Peak Hour Demand Factor".

(1.) "Peak Hour Demand" = (1.85) X (Maximum Daily Demand Value)

(2.) Eg., For "Balboa Island" gradient;

$$\text{"Peak Hour Demand"} = (1.85) \times (536 \text{ gpcd}) = 992 \text{ gpcd}.$$

4. Fire Flow Requirements:

- a. Design for determining pipe, reservoir and pump sizes for a given fire flow shall be in accord with the "Fire Flow Requirements" table herein below.
 - (1.) Except where the Fire Department has determined that a higher flow requirement is warranted.
 - (2.) In no case shall the public water system installations be sized to provide less than the fire flows stated in the "Fire Flow Requirements" table below. On site requirements may be reduced by the Fire Department where special fire resistant construction is provided or where a fire sprinkler system is installed, but public system fire flows shall not be reduced below the required flows given below.
- b. Fire flows, reservoirs and pumps shall be designed to meet the appropriate requirements under a "Maximum Day Demand" scenario.

5. Fire Flow Requirements Table:

Use Category	Fire Flow Demand (gallons per minute)	Duration (hours)	Number of Hydrants (each)
Single Family	1,000	2	1
Community Facilities	1,500	2	1
Multiple Family (one & two stories) & Closely Built Residential	2,000	2	2
Multiple Family (three stories or more) & Closely Built Residential	2,500	3	2
Multiple Family Attached Residential	3,000	3	2
Commercial (up to two stories)	3,000	3	3
Commercial (over two stories)	5,000	5	4
High-Rise Residential	5,000	5	4
Business Park / Industrial Park	5,000	6	4
Regional Shopping Center	6,000	6	4

- a. This table compiled from ISO and California Public Utilities Commission requirements for public fire flow.

C. System Pressure Design

1. Minimum residual pressures shall be 20 psi on the Maximum Day for all Fire Flow demand designs.
 - a. Maximum static pressure for the purposes of building and fire sprinkler system designs shall be 80 psi.

2. Minimum residual system pressure shall be 40 psi at Peak Hour on the Maximum Day.
3. Maximum static pressure shall be 140 psi, design shall attempt to achieve a maximum pressure of 110 psi, wherever practical.
4. Wherever possible, the water system shall be designed to have normal system pressures between 60 psi and 90 psi respectively at the upper and lower ends of a given pressure gradient.
5. If static pressure exceeds 100 psi, pressure regulators are required on the water mains at specified locations to create a separate system pressure gradient.
 - a. Creation of a new system pressure gradient requires approval of the Engineer and the Utilities Department. Design must be in accord with the City's Water Master Plan and/ or must be compatible with existing surrounding pressure gradients and their operation.
6. When the area requiring pressure reduction has less than 25 residential lots, individual pressure regulators shall be installed and maintained by property owners.
 - a. They shall be installed by the developer and shall become the property and responsibility of the property owner.
 - b. Individual pressure regulators shall be set to maintain 80 psi on the downstream side. Individual pressure regulators shall be as manufactured by ClaVal Company of Costa Mesa, California.

D. Structural Design

1. Pipe shall be designed and specified per ASTM and AWWA standards, current accepted engineering practice and the pipe manufacturer's recommendations, provided that:
 - a. Flexible pipe backfill load shall be the weight of the column of soil directly over the pipe (prism load),
 - b. Flexible pipe design deflection shall be a maximum of 3% (DL=1.0).
 - c. Minimum test pressure shall be 225 psi and minimum hydrostatic proof pressure for pipe shall be 300 psi, normal pressure test shall be the pressure rating or class of pipe plus 50 psi.
 - d. Gasketed bell & spigot, mechanical or flanged pipe-to-pipe and pipe-to-fitting joints shall be specified,
 - (1.) Mechanical joints shall be used on all pipe bends on DIP and PVC mains and shall specify retainer glands.

- (2.) Where flanged joints are specified, bolts, nuts and washers shall be type 316 stainless steel.
 - e. Standard Dimensional Ratio (SDR) or Dimension Ratio (DR) shall be determined and specified considering working pressures, external loads, 100° F operational temperatures, 100 year service life and maximum design deflection of 3% (DL = 1.0), except that:
 - (1.) Minimum thickness for PVC pipe closure pieces shall conform to the requirements of AWWA Standard C-900.
 - (2.) Use of any steel pipe requires special permission of the City Engineer.
 - f. Thickness class of ductile iron shall be determined and specified considering working pressures, external loads, diameter to thickness ratios for E' = 500 PSI, service and casting allowances specified in ANSI A21.50, provided that the following minimum thickness criteria is followed:
 - (1.) Minimum thickness for ductile iron pipe shall be class 52 for bell & spigot pipe, class 53 for flanged pipe and class 54 for groove-end pipe.
 - (2.) Pressure thickness classes of pipe outlined in the latest version of AWWA specifications are not recognized and are not approved by the City of Newport Beach.
- 2. Valve vaults and covers shall be designed and specified per these criteria and the Standard Special Provisions and Standard Drawings and the manufacturer's recommendations, provided that:
 - a. They shall be designed to support HS-20-44 loads, plus impact and earth pressures when situated in an existing or future roadway;
 - b. They shall be designed to support 300 psf plus earth pressure for the non-roadway installations, and;
 - c. Metal parts shall be provided in stainless steel, brass or aluminum materials.
 - (1.) Stainless steel covers and materials shall be required for all traffic loading designs.
 - (2.) Aluminum or stainless steel covers may be utilized for parkway or non-traffic designs.

E. Water Mains

- 1. Mains shall be sized to conform to the City's Water Master Plan. Where fire flow and hydraulic design dictate, the mains shall be increased in size over that specified

in the Master Plan, but shall not be sized less than that which is specified in the Master Plan.

2. Minimum diameter shall be 6 inches except that dead end lines serving 6 or less dwelling units not providing fire protection service may be 4 inches. In industrial areas, the minimum diameter shall be 8 inches. Water mains shall not be sized at 10, 14 or 20 inches in diameter. Other non-standard sizes shall not be allowed. The next larger, readily available, standard pipe size shall be specified.
3. Locations shall be in accord with STD-101-L.
 - a. Mains shall not be placed in parkway or median areas without special permission from the Utilities Department.
4. If future extension is possible, temporary dead ends shall be capped and extended beyond street improvements.
5. Mains shall be looped wherever possible.
6. Depth of cover from finished sub-grade to top of pipe shall be as follows:
 - a. 36 inches for 12-inch diameter and smaller mains.
 - b. Mains 12 inches in diameter and larger in arterial streets require special design.
 - c. PVC and other flexible pipe materials require special design and special permission from both the Utilities Department and the Engineer for approval.
7. Design flows shall ordinarily be based on Maximum Day plus Fire Flow or Peak Hour, whichever is greater.
 - a. For transmission mains 12 inches or larger, design head loss shall not exceed 5 feet per 1,000 linear feet.
 - b. For distribution mains 10 inches or smaller, design velocity shall not exceed 8 ft./ sec.
 - c. Fire flow velocity in mains shall be at least __fps but less than 10 ft./ sec.
 - d. Fire flow velocity in fire service connection pipes shall be at least __fps but less than 25 ft./ sec.
8. Thrust blocks shall be installed in accord with STD-510-L. If applicable, special design is required.
9. All mains 12 inches and larger shall have a profile shown on the improvement plans. Other plans for mains may require profiles at the request of the Engineer.

- a. Determinate factors will include the complexity of the installation proposed, the number and proximity of adjacent utility conduits the need for greater detail on the construction plans for clarity and ease of contractor installation.
10. All high points shall be equipped with air and vacuum release valve assemblies in accord with STD-515-L.
11. Maximum deflection allowable on curved alignments for pipe shall be in accord with the pipe manufacturer's recommendations.
12. Pipe deflections for short radius curves and angle points shall normally be accomplished by means of standard fittings, the location and type of which shall be detailed on the plans.
13. All ductile iron pipe and fittings shall be encased with a loose 8 mil thick polyethylene wrap. All pipe shall be sand bedded before pipe is laid in trench. Refer to City STD-106-L.

F. Water Valves

1. Maximum valve spacing shall be:
 - a. Residential.....800'
 - b. Commercial.....500'
 - c. Transmission Mains.....1300'
 - d. Valves shall be located at every junction of pipe in the distribution system network. As a rule of thumb, there should be no fewer than the number of pipes joined less one. (eg., at a cross intersection of pipes, there are 4 pipes, therefore, a minimum of 3 valves should be installed.)
2. Valve location requirements:
 - a. On the prolongation of a property line, preferably at BCR's or ECR's.
 - b. Flanged to main at cul-de-sac, private drive, easement or alley intersections at other locations.
3. Butterfly valves shall be used on all mains with a diameter of 12 inches or greater. Valves shall be epoxy lined. Lining shall be factory applied to sandblasted SSPC-10 "near white" surface via electrostatic application and shall be thermal fusion bonded to the surface. Minimum dry film thickness of lining shall be 5 mils. Brush on epoxy coating systems for valves shall not be considered an acceptable alternate coating.
4. Resilient wedge gate pattern valves may be used in lieu of butterfly valves on water mains and pipelines less than 12 inches in diameter.

- a. Tapping valves shall be resilient wedge pattern. The make, model and manufacturer of the valves must be on the Utilities Department's approved list.
 - b. Resilient wedge valves may be used on valves larger than 12" with prior approval from Utility Department.
 - c. Resilient wedge valves shall have valve discs fully encapsulated, shall be epoxy lined and coated, shall have type 316 stainless steel stem and bolted parts.
- 5. Butterfly valves and gate valves shall not be used on mains where operating pressures exceed 150 psi.
 - 6. Pressures in excess of 150 psi require the use of lubricated plug valves. Such valves shall be approved in advance by the Engineer.
 - 7. All valves 18 inches and larger shall be in City standard concrete vaults of minimum 8 ft. x 10 ft. dimension.
 - 8. A valve anchor shall be installed in accord with STD-506-L. If not applicable, special design is required.
 - 9. Except those installed in vaults, all valves installed with greater than 4H feet of cover (from street surface to top of operating nut) shall have a valve operator nut extension installed in accord with City specifications.
 - 10. Buried valves which are normally closed shall have 4" x 4" redwood posts inserted in the valve operator riser can.
 - a. Redwood post shall be painted white and shall be cut to a length such that it will rest on the operator nut of the valve and extend to within 4 inches of the bottom of the valve riser box without bearing against any part of it.
 - b. Inscribed onto a brass tag nailed or screwed onto the end of the post shall be the message, "*normally closed valve - do not open*".

G. Valve Vaults

- 1. Vaults shall be reinforced concrete and equipped with the following:
 - a. Spring-open-assist hinged access opening with minimum 30" x 36" dimension and OSHA dimensioned ladder.
 - b. Removable manhole cover at least 30 inches in diameter centered over the valve or regulator, larger if necessary. The valve must fit thru the clear opening of the manhole over it.

- c. Air vents high (1 ft. from the vault ceiling) and low (1 ft. from the vault floor) through the vault walls, duct shall be PVC schedule 40 duct pipe, fittings and riser assemblies.
 - d. Floor drainage consisting of a round, recessed sump of 12-inch minimum diameter. Sump shall be located at the low point of the vault floor which shall be near the access opening and shall have a cast iron grate cover.
 - e. Victaulic and flexible couplings with banded restraint opposite sides of each valve or regulator. Couplings shall have stainless steel connecting hardware and bolts.
- 2. Vaults to receive thrust or heavy traffic loading require special design and special permission. Piping shall be designed to prevent thrust against vault walls wherever possible.
 - 3. Additional requirements and more detailed specifications are applicable. Contact the Utilities Department for these requirements.
 - a. Refer to the written specifications, "*Valve Vault Specifications*", dated, July 1994.

H. Fire Hydrants

- 1. Fire hydrant spacing shall be as follows:
 - a. Desired spacing is 300 feet, with 500 feet maximum for low density residential.
 - b. Desired spacing is 300 feet, with 400 feet maximum for commercial, multiple or closely built residential and industrial.
- 2. Location of hydrants shall be as follows:
 - a. Within 3 feet of the prolongation of the BC or EC radial or property line on the tangent curb.
 - b. On the same side of the street as the main.
 - c. Off the largest main at the intersection of mains where the larger main is not a transmission main.
- 3. Hydrants shall be installed in accord with STD's-500-L or 501-L. If not applicable, special design is required.
- 4. If a cul-de-sac is over 350 feet long, a fire hydrant shall be installed approximately 100 feet from the closed end of the street.
- 5. Hydrants shall not be connected to mains larger than 12 inches in diameter without prior approval of the Utilities Department.

6. Fire Marshall may require commercial type or double steamer outlet fire hydrants in non-residential or high density locations.

I. Domestic Water Services

1. One separate service shall be installed for each lot or condominium unit.
 - a. New developments of duplex, triplex and four-plex structures require individual water service connections, unless otherwise approved by the Public Works Department.
 - b. New apartment developments require separate water service connections for each apartment unit, unless otherwise approved by the Public Works and Utilities Departments.
2. Minimum size service shall be 1-inch diameter. Copper services shall be installed in accord with the applicable City standards.
3. Services shall be installed in accord with STD-502-L or 503-L and 513-L, and for multiple services use STD-519-L. If not applicable, a special design is required and must be approved by the Public Works Department and the Utilities Department.
4. Where solder joints are specified, low lead-content, silver solder material shall be used.
5. Copper flared joints may not be used on service pipe or fittings 1H inches diameter or larger. These larger sizes require solder or threaded connections only.
6. Compression type couplings, fittings and connectors are expressly prohibited for all sizes of water service piping.

J. Fire Service or Fire Sprinkler Connections

1. Fire service connections shall be constructed per the applicable City Standard Drawings.
2. Exclusive water facility easements shall be provided for all sprinkler and fire service connection piping and backflow devices. Refer to the applicable Standard Drawing for minimum dimensions.
3. Siamese pumper connections and any other required appurtenant piping or controls shall be installed downstream of the backflow device.
 - a. Downstream of the City-owned portion of the backflow assembly and the below-grade 90° bend on the private side of the backflow device.
4. Calculations for fire sprinkler designs shall be submitted to the Building and Fire Departments for review.

5. The level of backflow protection shall be determined by the City Public Works Department.
 - a. The minimum level of backflow prevention for a fire service or fire sprinkler connection shall be a double-check device.
 - b. A higher level of backflow protection may be required. Refer to the Public Works Department for more detailed information about the City's *Backflow and Cross Connection Control Program*.
6. Reduced Pressure Principal (RPP-type) backflow prevention devices shall be required wherever:
 - a. There is a private booster pumping system on the site being served.
 - b. There are more than one fire service connection to the same parcel or site.
 - c. The building being serviced by the connection is 3-stories in height or greater.
 - d. There are hazardous chemicals or materials either stored or used on the site being served by the connection.
 - e. There is a private storage or fire protection reservoir on the site being served by the connection.
 - f. The connection serves a marina or boat dock slip.

K. Pressure Booster Pump Stations (Private Domestic & Private Fire)

1. Pressure boosting stations shall be permitted only as a temporary installation by special permission from the Public Works Department.
 - a. Where such installations are allowed, they shall be served by metered service connections having both RPP type backflow prevention assembly and pressure sustaining valve equipment.
 - (1.) These installations require special design and review by the Utilities Department and the Public Works Department.
 - b. Backflow device shall be reduced pressure principle (RPP) type in accord with the applicable City standards.

IV. SEWER SYSTEM

A. Mains

1. General

- a. Substantiating engineering calculations for sizing pipe and structural designs shall accompany all plan submittals.
- b. Minimum size shall be 8 inches inside diameter.
- c. Design flow shall not exceed H of full depth.
- d. Pipe joints shall be elastomeric compression type unless otherwise specified.
- e. Pipe material shall be SDR-35 PVC or standard strength VCP.
- f. HDPE, ductile iron, RPM or filament bonded PVC flexible pipe materials can only be used upon special approval by the Utilities Department.
- g. Structural design shall be per water system requirements listed in Section III D. "Structural Pipe Design", except that:
 - (1). Minimum test pressure shall be per the *Standard Specifications*.
 - (2). Minimum factor of safety for VCP shall be 1.5.
- h. PVC fittings shall be prefabricated (molded) full-body fittings.
- i. Backfill shall be in conformance with the *Standard Specifications* Section 306-1.3, except that relative compaction shall be 90% minimum.
- j. Pipe Bedding
 - (1.) VCP shall be bedded in conformance with section 306-1.2.1 of the *Standard Specifications*. PVC shall be bedded in 1 inch crushed rock.
 - (2.) Pipe bedding and backfill shall be done in accord with the applicable portions of City STD-105-L and STD-106-L.

2. Locations

- a. Alleys - Mains shall be offset 3.0 feet minimum from centerline to clear gutter. The offset shall be to the opposite side of the alley from any existing or proposed water main.
 - (1.) Clearance between sewer and water mains shall be in strict accord with the California DOHS requirements for "water and sewer separation."
 - (a). Horizontal clearance shall be at least 10 ft. wall to wall.

- (b). Horizontal clearances less than 10 ft., but greater than 4 ft. may be allowed with special material construction. Utilities Department and State DOHS written permission is mandatory.
 - (2.) Clearance between sewer and utility conduits other than water shall be at least 2 ft. horizontal and 1 ft. vertical.
 - b. Streets - Main locations shall be in accord with STD-101-L.
 - c. Sewers in streets with more than 84 feet of right-of-way width require special design.
 - d. Extend and cap all dead ends beyond pavement limits. Refer to STD-401-L.
3. Minimum Gravity Sewer Slopes expressed in units of feet per foot:

Pipe Size (in.)	Minimum Slope (ft./ft.)	Preferred Slope (ft./ft.)
8"	0.0032	0.0040
10"	0.0026	0.0032
12"	0.0020	0.0032

4. Gravity Sewer Hydraulic Criteria
- a. Hydraulic analysis shall be performed using Manning's Equation in the US Customary Unit System. Long-hand, manual calculations may be requested for City review on all sewer designs.
 - (1.) Manning's Roughness coefficient shall not be less than 0.013 for any sewer main. ($n \geq 0.013$)
 - (2.) Flows shall be first analyzed as "steady, uniform, non-turbulent" flow.
 - b. Velocity Criteria
 - (1.) Minimum design velocity shall be 2.0 ft./sec.
 - (2.) Maximum velocity shall be 6.0 ft./sec. Analysis shall be performed to determine whether flow regime is "sub-critical" or "super-critical".
 - (a.) Initial critical flow analysis shall be via Froude Number (f).
 - (b.) Depth of flow limit requirement shall be for "sub-critical" flow depth.
 - (3.) Froude Number (f) shall be determined from the following equation:

$$f = \frac{v}{\sqrt{gd}}$$

where the variables in the equation are:

fis the Froude Number

vis the velocity of the waste stream

gis the gravitational constant (32.2 ft/ sec²)

dis the depth of flow (subcritical depth)

5. Sewer Hydraulic Loading Design

- a. Wastewater hydraulic calculations shall be performed utilizing the quantities of wastewater from the table below; (these should be considered design minimums, they are based on actual field flow monitoring tests):

Development Size (dwelling units)	Average flow (gallons per day)	Peaking Factor (dimensionless)	Peak flow (gallons per day)
0 to 75	315	3.80	1,200
76 to 150	285	3.65	1,040
151 to 250	265	3.40	900
250 & up	245	3.15	770

- b. Certain developments with special circumstances may require design to consider flows higher than those in the table above. In no case shall the design flows be less than the amounts determined by the table above.

B. Manholes

Manholes shall be designed in accord with City of Newport Beach Standards, Standard Drawings, Standard Special Provisions and these Design Criteria. Manholes are required:

1. At all changes in slope.
2. At all changes in direction.
 - a. Horizontal curves for radii in excess of 150 feet may be used in areas without services only by the special approval of both the Utilities Department and the Public Works Department and only where straight sewer main runs are infeasible because of interference with other underground utilities.
3. At all intersections of mains. Match crown lines. Use 0.20 foot drop through manhole per City STD-401-L.
4. At all intersections between mains and laterals sized 8 inches and larger.
5. Minimum spacing is 300 feet; maximum spacing is 400 feet.
6. At the ends of dead end mains greater than 200 feet in length.
7. To have a special lining (either fiberglass or T-Lock) installed wherever:

- a. Any sewer main connecting to the manhole has a slope greater than 7%.
- b. Any change in slope of 5% or greater occurs between the upstream and the downstream manhole.

C. Terminal Cleanouts

1. Are required at ends of all mains where it is impractical or impossible to construct a sewer manhole.
2. May be used at other locations only by special permission of the Public Works Department.

D. Laterals

Each residential dwelling unit, residence, condominium, or rental unit (for buildings with four or less units) shall have an individual lateral, unless otherwise approved by the Public Works Department.

1. Size
 - a. Single family, apartment or condominium units shall be 4 inches minimum diameter per City STD-406-L unless slope is less than 6 inch per foot. (In which case the lateral shall be upsized to 6 inches diameter.)
 - b. All other laterals shall be a minimum of 6 inches in diameter.
2. Location
 - a. At right angles or radial to street right-of-way.
 - b. Center of lot frontage or 5 feet toward the center of the lot from the downstream lot line. All lateral locations shall be shown and dimensioned or stationed on the construction plans.
 - c. In commercial developments, laterals shall connect the main line at manholes wherever possible.
 - d. All lateral connections 8 inches and larger shall connect to the sewer main at manholes.
 - e. All connections to existing manholes shall be mechanically saw cored and the joints made shall be sealed closed around the installed pipe using a non-shrink concrete grout or epoxy material.
3. Minimum depth of lateral pipe cover shall be 4 feet below finished grade at property line for level lots or lots sloping toward street. Special design is required for lots sloping away from street.

4. Cleanout shall be provided at property line in accord with STD-406-L on all lateral connections 6 inches in diameter and smaller. 8-inch diameter laterals and larger require manholes as cleanouts at or near the property line.

E. Wastewater Pump Stations

1. Special Design Required

- a. In all cases where a wastewater lift station is required, special design and review by City is required.

2. General Design Requirements

- a. Pumping stations shall be of the "dry-pit/ wet-well" type constructed of highly reinforced concrete.
- b. Stations shall be equipped with a double compartment wet well.
- c. Stations shall have an approved high water and power failure alarm system with telemetering compatible with existing City telemetry system.
- d. Station design shall include painted dry-pit room interior, painted, lined and coated machinery, piping and fittings. Properly lined interior wet-well surface. Waterproofed exterior station coating. Detailed specifications shall be prepared and approved by City for all required painting, coating, lining and related coating surface preparations.
- e. City shall be provided with complete manufacturer's brochures, technical data, operational data and maintenance manuals for all equipment and controls.
- f. An emergency bypass connection shall be provided to allow connection of the City's portable pumping equipment to a suction point and pump to the downstream side of the lift station.
- g. Station shall be a multiple pump unit station. Four (4) pump units is the desired number. Two (2) units shall be sized to run at peak flow conditions independent of the other. Two (2) smaller pump units shall be sized to operate under average flow conditions.

3. Structural

- a. Structures shall be highly reinforced concrete. Reinforcing steel shall be epoxy coated.
- b. In residential areas, structures shall be primarily below ground.
- c. Cast-in-place steps to access the lower portions of the station shall be poured integrally with the station.

- d. Spring open-assist access hatches with all metallic parts provided in type 316 stainless steel material.
- e. Provide a roof hatch or manhole suitable for removal and replacement of major equipment components. Each pumping unit shall have an opening centered over it. (With the exception of the submersible sump pump.)
- f. Provide equipment-lifting eyes in roof of the station.
- g. All structures shall have ample working room around machinery. Minimum clearance from pumping units to wall shall be 48 inches or greater as needed for adequate maintenance.
- h. Design of structures shall include waterproofing and a subdrain system.
- i. Interior station metallic components shall be type 316 stainless steel wherever possible. Other components shall be hot dipped galvanized after fabrication.

3. Pumps

- a. Pumping units shall be close coupled, vertically mounted, high solids capacity, vortex type pumps. Motors shall be mounted vertical and shall be of the open drip proof type.
 - (1.) Pumps shall be capable of passing a 3-inch diameter solid sphere.
 - (2.) Pump impellers shall be fabricated from stainless steel. Cast iron or bronze impellers shall not be used.
 - (3.) Pump frame and bowl casing may be manufactured from cast or ductile iron materials.
- b. Minimum desirable pump suction diameter is 4 inches
- c. Maximum suction velocity is 4 ft./sec.
- d. Maximum discharge velocity is 8 ft./sec. Minimum discharge velocity shall be 2 ft./sec.
 - (1.) Special permission may be granted for lower discharge velocity provided the station's force main is properly sized for minimum velocity.

4. Mechanical and Piping

- a. All design shall satisfy the minimum requirements of the State Health Code and OSHA safety regulations.

- b. All dry-pit room piping shall be ductile iron pipe and fittings swedge lined with polypropylene. Refer to project detailed specifications of Polypropylene lined pipe and fittings in accord with the Dow Chemical Company™, swedge-lining process.
- c. All pipe and fittings, except where otherwise noted on the plans shall be flanged. Flange pattern shall be ANSI 150 lbs. pattern as per AWWA water pipe specifications.
 - (1.) Flange joints shall be connected with type 316 stainless steel hex-head nuts and bolts.
 - (2.) Flange gaskets, where required, shall be full faced, nylon fibre impregnated rubber gasket material.
 - (3.) Flanged, thrust bearing, pipe-to-wall sleeves shall be provided for connection from wet-well to dry-pit for each pumping unit.
 - (4.) Suction and discharge of each pumping unit shall have a restrained flexible pipe connection which allows for easy assembly and disassembly of the pumping unit and connecting piping.
 - (a.) Locate a flexible coupling between the suction valve and pumping unit. Coupling shall be epoxy lined and have stainless steel hardware. Install it with sufficient space to slide it away from pipe joint to allow for easy disassembly. Provide approved harness restraint assembly, ie., eye bolts thru adjacent pipe flanges with stainless steel all thread rod.
 - (b.) Locate a victaulic grooved pipe coupling on the discharge side of the pumping unit between the pump and the check valve. Coupling shall have stainless steel connecting hardware.
 - (5.) Pump station bypass piping connection is required. A quick-connect design shall be designed. Submit drawings for Engineer approval.
 - (6.) All discharge piping and other conduit connections from the station thru the walls shall be water-tight and shall be made utilizing wall sleeve with "weep-ring" and Link-seal™ type mechanical elastomeric annular discharge pipe seal.
 - (7.) All equipment mounts (floor, ceiling & wall) shall be fabricated from approved type 316 stainless steel hardware.
 - (a.) Pipe supports shall be in accord with the City's STD-522-L.
- d. Provide an automatic actuating submersible type electric sump pump (slope floor to sump recess) with a check valve and an isolation valve in its discharge pipe to the station wet well.

- (1.) Sump pump discharge piping shall be schedule 80 glue-joint PVC. Isolation valve shall be PVC ball valve.
- e. Pump design capacity shall be based on average daily flow for the "stripper" pump and average day peak hour flow for the main pump units. Each pump shall have a second, identically designed unit as an alternate duty pump.
 - (1.) Pumps shall be sized utilizing the sewer loading table in Section IV, A, 5, a., of these "*Design Criteria*".
 - (2.) Pumps should cycle no more than four (4) times per hour under normal design conditions and no more than six (6) times per hour under more extreme conditions.
- f. All isolation valves shall be plug valves with wrench or worm gear hand wheel operator.
 - (1.) Valves shall be flanged end.
 - (2.) Valve seats and discs shall be type 316 stainless steel.
 - (3.) Special linings and coatings are required. Specifications for lining and coating may vary by application and location. Refer to the Engineer for details on applicable specifications.
 - (4.). Examples of acceptable valve include:
 - (a.) DeZuric eccentric plug valve
 - (b.) Rockwell-Nordstrom lubricated plug valve
 - (c.) Homestead "175 Ballcentric" valve
- g. All stations shall have a 1 inch diameter metered fresh water service adjacent to the station. Refer to STD-502-L.
 - (1.) RPP type backflow prevention device is required on all domestic water services and connections near the station. Refer to STD-520-L.
- h. Make provision for standby emergency power connection for use during power outages.
 - (1.) An electrical transfer switch mechanism of 60 amp capacity (higher where appropriate) shall be wired and mounted in the stations electrical control panel per City electrical standards.
- i. Sump pumps and air blowers shall be provided and shall be easily removable and accessible for maintenance.
 - (1.) Blower shall be wall mounted California Turbo™ brand model of a size appropriate to evacuate the air in the dry-pit at least one time every six (6) minutes.

- (2.) Blowers shall be designed for continuous operation.
- (3.) Ventilation design shall provide for a maximum indoor space temperature of 105° F.
- j. Metallic hardware, pumping units or other structures and supports shall not be mounted directly on the station floor; provide high strength epoxy concrete pedestals of 2-inch minimum height.
- k. Provide a 1 inch PVC schedule 40, stuffing box drain line from each pump to the station sump drain. All conduit clips and mounts shall be type 316 stainless steel.
- l. Piping layout shall provide for easy access to pumps for maintenance. Minimum clearance between pump centerlines shall be 5 feet.
- m. Provide removable safety guards for all rotating parts of station equipment.
- n. Provide flanged check valves on all pumping unit discharge lines. Discharge check valve shall be equipped with external arm & outside spring operated. Valve should be oriented on a horizontal run of piping where feasible.
 - (1.) Valve shaft, seat ring and all other internal metallic parts shall be type 316 stainless steel.
 - (2.) Valve shall be internally lined with thermal fusion bonded epoxy coating. Minimum dry film thickness shall be 6 mils.

5. Pump Actuation & Station Telemetry

- a. Provide manual selector switch to alternate lead lag pump for both the "stripper" and main pumping units.
- b. Provide a "hand-off-automatic" selector switch for each pumping unit.
- c. Provide an automatic alternating unit selector switch with a manual override switch for each pumping unit. Each unit shall have a totalizing, digital reading, panel mounted, watt hour meter.
 - (1.) Provide a defeat feature to override the automatic selector function. This allows one unit to be taken out of service for periodic maintenance without creating an alarm condition.
- d. The control mechanism shall be of the air bubbler control type. Detailed specifications are available from the City Utilities Department.
- e. Provide a mercury float switch pump actuation assembly as a back-up system to the bubbler control system.

- (1.) Mount the switch assembly in the wet well above the normal high water level. Special design of the mounting bracket is required. Bracket shall be entirely type 316, stainless steel.

6. Electrical

- a. All electrical installations shall comply with the National Electrical Code and Division of Industrial Safety requirements.
- b. Use enclosed prefabricated stainless steel electrical panels concrete slab pedestal mounted above ground level outside the pump station.
- c. Provide elapsed time watt-hour meters for all pumping units.
 - (1.) Reset type, shall be specified.
- d. Provide explosion-proof electrical appurtenances below ground and an approved type disconnect with time delay.
- e. Provide blower and heater system within main electrical panels.
- f. Provide manual switch adjacent to each motor to override the control panel. Switch shall be mounted at motor height within 3 feet of the unit's motor.
- h. Adequate lighting and electrical outlets shall be provided. Outlets shall be mounted at motor height. Light enclosures shall be rated NEMA "explosion-proof".
- i. General control panel wiring requirements.
 - (1.) All wiring shall be color coded. Coding shall be in accord with the color chart below:

(a.) Coding chart:

color	function	Phase	voltage
purple	telemetry	single	12 volt
red	hot	single	120 volt
white	neutral	single	120 volt
red	hot	single	240 volt
black	hot	single	240 volt
black	leg one	three	240 volt
blue	leg two	three	240 volt
red	leg three	three	240 volt
white	neutral	three	240 volt
green	ground	three	240 volt

- (2.) Wiring shall be stranded, THWN type, insulated wire.
- (3.) All wiring shall be bundled where appropriate and harnessed together with plastic tie wraps at regular intervals.
- (4.) Length runs or bulky bundles of wiring shall be run in plastic raceways inside control panel enclosures from one component to another.
- (5.) Wire shall be labeled with ID tags at both ends of the wire.
- (6.) All three phase wiring and all high voltage (over 120 volts) shall be specially labeled as such.

7. Painting

a. General

- (1.) All painting shall consist of the multi-coat paint systems, approved or specified by the Engineer, applied in a manner to provide a uniform thickness and smooth appearance. Minimum dry film thickness shall be as specified below.
- (2.) Surface preparation shall be as per the specifications of the "Steel Structures Painting Council", hereinafter SSPC.
- (3.) Paint shall be abrasion, sulfide and mildew resistant.

b. Surface preparation

- (1.) All surfaces to receive paint shall be properly cleaned and washed of all loose material and dirt.
- (2.) Surfaces with oily or greasy substances on the surface shall be solvent washed.
- (3.) New concrete shall be "brush-off" sandblasted (SSPC-5), acid etched, cleaned and dried.
- (4.) Existing (older than 6 weeks) unpainted concrete or previously painted concrete shall be "commercial grade" sandblasted (SSPC-6), acid etched, cleaned and dried.

c. Approved painting & coating systems

- (1.) Interior walls and ceilings shall be painted with High Gloss White, Rustoleum color # 2766.

- (2.) Exterior walls, below grade shall receive three (3) coats of hot-mop applied asphalt coal-tar enamel. Minimum total dry film thickness shall be 15 mils.
- (3.) Exterior walls, above grade, shall receive two (2) coats of Weather Clad Sage, Sherwin Williams color # B42G116. Minimum total dry film thickness shall be 4 mils.
- (4.) All equipment, piping, valves, fittings, motor cases, conduits, cabinets, machinery, etc., shall be painted with two (2) coats of Federal Safety Green, Rustoleum color # 933. Minimum total dry-film thickness shall be 4 mils.

V. DRAINAGE

A. General

- 1. All drainage design shall be in accord with the *"latest County of Orange PFRD Criteria"*.
- 2. Hydrologic and hydraulic design calculations and flow maps for all tributary areas shall be submitted with plans.
- 3. The use of underground storm drain systems shall be required:
 - a. When flooding or street overflow will cause serious damage.
 - b. When future upstream development will cause drainage problems.
 - c. When existing drainage facilities are adjacent to proposed development.
 - d. At all intersections and at mid-block on arterial streets when the width of storm flow in the street exceeds one travel lane (based on a 10 year storm).
- 4. The use of underground storm drain systems shall be investigated:
 - a. When the storm water level in the street at the design storm flow is within 0.20 feet of the top of curb.
 - b. When the storm water velocity exceeds 8 ft./sec.
 - c. When the storm water travels over 1000 feet overland.
- 5. Open drainage ditches shall not be permitted in public right-of-way.
- 6. The type of drainage facility and right-of-way shall be provided from the development to a satisfactory point of disposal.

7. Permanent drainage facilities and right-of-way shall be provided from the development to a satisfactory point of disposal.
8. The usage of cross gutters on arterials and collector streets will not be allowed.
9. The minimum velocity in a pipe flowing full shall be 2 ft./sec.
10. Drainage and grading shall consider water quality and shall be in conformance with City Council policies L-18 & L-22.
11. All private drain systems that discharge to a public right of way, storm drain, or body of water shall utilize water quality devices and BMPs as approved by the Public Works and Building Departments.

B. Design

1. The rational method outlined in the Hydrology Manual by the Orange County PFRD shall be used when applicable.
2. Collectors within a small area (100 acres or less) shall be designed to a 10 year storm provided no serious damage or danger will result from occasional flooding.
3. Collectors within a larger area (greater than 100 acres) shall be designed to a 25 year storm, provided no serious damage or danger will result from occasional flooding.
4. Main channels serving major drainage areas shall be designed for a 50 year storm.
5. Special consideration shall be given to drainage of sump areas. Use a minimum of a 25 year storm for design.
6. Water should be intercepted at sufficient intervals to maintain the following favorable conditions for vehicles and pedestrians.

a.	10 year storm	Maintain one unflooded traffic lane.
b.	25 year storm	Maintain one half of one unflooded traffic lane.
c.	50 year storm	Prevent water from ponding beyond property line.
d.	25 year storm or less	Keep depth velocity product (expressed in feet and feet per second) from exceeding six. Values in excess of six create a hazardous condition for pedestrian traffic.
7. Storm drains shall be designed for open channel flow.

C. Curb Inlets and Connectors

- 1. All curb inlets shall be designed in accord with the City's Standard Drawings.
- 2. Curb inlets shall be located so as to eliminate whenever possible open concrete cross gutters.
- 3. Minimum connector pipe inside diameter shall be 18 inches. Median drains shall have a minimum inside diameter of 12 inches.
- 4. Inlet sizing shall be based on City of Los Angeles, or similar approved design charts.

D. Storm Drain Pipe

- 1. Location shall be in accord with STD-101-L.
- 2. Minimum size of inside diameter of pipe shall be 18 inches.
- 3. The material for storm drains shall be reinforced concrete pipe or asbestos cement pipe.
- 4. Reinforced concrete pipe shall be designed per the Orange County Flood Control District Manual and shall have a load factor of 1.5 (do not use OCFCD D-Load tables), and the minimum safety factor shall be 1.25.
 - a. RCP for use in sandy soils shall contain rubber gasketed type joints.
- 5. Manhole spacing

Conduit Diameter	Spacing
30" or less	300'
30" - 45"	400'
45" or greater	500'

- 6. Extra bar cover is required where design velocity is greater than 20 ft./sec.

end